Sorbent Development for H$_2$S Removal

Session Chairs

Ranjani Siriwardane
U.S. Department of Energy
National Energy Technology Laboratory
USA

Javad Abbasian
Illinois Institute of Technology
USA

Integrated Gasification Combined Cycle (IGCC) system is one of the most promising advanced power systems. It has been predicted that IGCC systems, with hot gas cleanup, will be able to offer significant improvements in environmental performance, achieving overall plant efficiencies exceeding 50%, compared to conventional pulverized coal-fired plants, which have efficiencies of 33 to 35 percent. It is expected that IGCC with hot gas cleanup will be capable of producing power at a 20 percent lower cost of electricity then that of conventional coal based systems. Furthermore, it is predicted that this increase in efficiency will be able to reduce CO$_2$ emissions by 35 percent.

Removal of hydrogen sulfide from the coal gasification gas stream to ppm range is important for environmental reasons and to protect system components from corrosion and deterioration. Development of a suitable regenerable sorbent for the removal of hydrogen sulfide from the gasification product gas stream has been a major barrier issue for gas stream cleanup at high temperatures. Major challenges for the development of a regenerable sorbent have included decrepitation, spalling, attrition, and loss of reactivity. These critical problems have to be addressed for successful implementation of hot/warm gas desulfurization process in IGCC systems.

In addition to IGCC application, development of viable desulfurization systems for production of ultra clean synthesis gas is critical for fuel cell applications that require the sulfur levels to be reduced to ppb levels. Even more stringent requirements are expected if the coal gas is to be utilized in chemical production applications.

Papers related to development of sorbents for H$_2$S removal from hot/warm coal gas for both transport/fluid bed and fixed bed reactor systems, and effect of other contaminants on the performance of the sorbent, as well as mathematical modeling of these systems will be presented in the session.